

CLAIMS

1. A disk drive comprising:

a disk,

an optical pickup for recording information on said disk or for reproducing information recorded on said disk,

a balancer for movably accommodating one or plural magnetic balls in the ring-shaped hollow section thereof and provided with a magnet for attracting said magnetic balls inside said ring-shaped hollow section, wherein

said magnetic ball is separated from said magnet by rotating said disk in a state wherein said optical pickup is not processing an input signal derived from light reflected by the face of said disk and said optical pickup is not writing information on said disk.

2. A disk drive in accordance with claim 1, wherein

said process of separating said magnetic ball from said magnet is carried out in a spin-up process at the start of said disk drive.

3. A disk drive comprising:

a disk,

a balancer for movably accommodating one or plural magnetic balls in the ring-shaped hollow section thereof and provided with a magnet for attracting said magnetic balls inside said ring-shaped hollow section, wherein

in the case when the rotation speed of said disk is changed from a first rotation speed including a stop state to

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a second rotation speed higher than the first rotation speed,

said case includes a case wherein after the rotation speed is raised from the first rotation speed to a third rotation speed higher than the second rotation speed, the third rotation speed is changed to the second rotation speed, and

said magnetic ball separates from said magnet at the third rotation speed.

4. A disk drive comprising:

a disk,

a balancer for movably accommodating one or plural magnetic balls in the ring-shaped hollow section thereof and provided with a magnet for attracting said magnetic balls inside said ring-shaped hollow section, wherein

at least one electric circuit parameter adjustment is carried out in a process wherein said magnetic ball is separated from said magnet by rotating said disk.

5. A disk drive in accordance with claim 4, wherein said parameter adjustment includes laser power adjustment or optical pickup focus system adjustment.

6. A disk drive comprising:

a disk,

a balancer for movably accommodating one or plural magnetic balls in the ring-shaped hollow section thereof and provided with a magnet for attracting said magnetic balls inside said ring-shaped hollow section, and

an impact detection section for detecting an impact

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caused by the behavior of said magnetic ball.

7. A disk drive comprising:

a disk,

a balancer for movably accommodating one or plural magnetic balls in the ring-shaped hollow section thereof and provided with a magnet for attracting said magnetic balls inside said ring-shaped hollow section,

an impact detection section for detecting an impact caused by the behavior of said magnetic ball, and

a rotation speed detection section for detecting the rotation speed of said disk at the time of the detection of said impact.

*Sub a1) 8. A disk drive in accordance with claim 1, 3, 4 or 7, further comprising:*

an impact detection section for detecting an impact caused by the behavior of said magnetic ball, and

a rotation speed detection section for detecting the rotation speed of said disk at the time of the detection of said impact, wherein

said impact detection section detects the timing of the separation of said magnetic ball from said magnet, and

said rotation speed detection section detects the rotation speed of said disk at the timing of said separation.

9. A disk drive in accordance with claim 7, wherein  
said impact detection section detects the timing of the attraction of said magnetic ball by said magnet, and

said rotation speed detection section detects the rotation speed of said disk at the timing of said attraction.

*Sub 92* > 10. A disk drive in accordance with claim 7 or 9, wherein

said impact detection section detects an impact on the basis of the output signal of said optical pickup.

11. A disk drive in accordance with claim 10, wherein said impact detection section detects an impact on the basis of the focus error signal or the tracking error signal of said optical pickup.

*Sub 93* > 12. A disk drive in accordance with claim 7 or 9, wherein

said impact detection section is a piezoelectric ceramic sensor.

13. A disk drive comprising:

a disk,

a balancer for movably accommodating one or plural magnetic balls in the ring-shaped hollow section thereof and provided with a magnet for attracting said magnetic balls inside said ring-shaped hollow section, wherein

in the case when the rotation speed of said disk is changed from a first rotation speed to a second rotation speed lower than the first rotation speed,

said case includes a case wherein after the rotation speed is lowered from the first rotation speed to a third rotation speed lower than the second rotation speed, the third rotation

speed is changed to the second rotation speed, and  
said magnetic ball is attracted by said magnet at the  
third rotation speed.

14. A disk drive comprising:

a disk,

a balancer for movably accommodating one or plural  
magnetic balls in the ring-shaped hollow section thereof and  
provided with a magnet for attracting said magnetic balls inside  
said ring-shaped hollow section, wherein

in the case when reproduction or recording is carried  
out continuously in a region from a position to another position  
on said disk,

when the maximum value of the disk rotation speed in  
said region is lower than a separation rotation speed at which  
said magnetic ball separates from said magnet and higher than  
an attraction rotation speed at which said magnetic ball is  
attracted by said magnet, and

when the minimum value of the disk rotation speed in  
said region is said attraction rotation speed or less,

said case includes a case wherein the rotation speed  
of said disk is set at said attraction rotation speed or less  
before reproduction or recording.

15. A disk drive in accordance with claim 14, wherein

the relationship expression of  $f_0 \times \{(\text{the rotation speed at the innermost periphery}) / (\text{the rotation speed at the outermost periphery})\} < f_1$  is established, wherein  $f_1$  designates

the rotation speed at which said magnetic ball separates and  $f_0$  designates the rotation speed at which said magnetic ball is attracted.

*Sub A4* > 16. A disk drive in accordance with claim 14 or 15, comprising:

an impact detection section for detecting an impact caused by the behavior of said magnetic ball, and

a rotation speed detection section for detecting the rotation speed of said disk at the time of the detection of said impact, wherein

said impact detection section detects the timing of the separation of said magnetic ball from said magnet, and said rotation speed detection section detects the rotation speed of said disk at the timing of said separation, and

said impact detection section detects the timing of the attraction of said magnetic ball by said magnet, and said rotation speed detection section detects the rotation speed of said disk at the timing of said attraction.

17. A disk drive comprising:

a balancer for movably accommodating one or plural magnetic balls in the ring-shaped hollow section thereof and provided with a magnet for attracting said magnetic balls inside said ring-shaped hollow section, and

a behavior detection section for detecting the behavior of said magnetic ball.

18. A disk drive in accordance with claim 17, wherein

the housing of said ring-shaped hollow section is formed of a transparent material, and

said behavior detection section is a photosensor.

19. A disk drive in accordance with claim 18, wherein the housing of said ring-shaped hollow section has a light-gathering section.

20. A disk drive in accordance with claim 17, wherein the housing of said ring-shaped hollow section is formed of a nonmetallic material, and

said behavior detection section is an electrostatic capacitance type sensor.

21. A disk drive in accordance with claim 17, wherein a determination is made as to whether said magnetic ball is rolling along the external peripheral face of said ring-shaped hollow section or not by comparing the period of the output signal of said behavior detection section with the period of the output signal of a rotation speed detection section for detecting the rotation speed of said disk.

22. A disk drive in accordance with claim 17, wherein a determination is made as to whether said magnetic ball has been attracted by said magnet or not on the basis of the output signal of said behavior detection section.

23. A disk drive in accordance with claim 17, wherein a determination is made as to whether said magnetic ball is rolling along the external peripheral face of said ring-shaped hollow section or not by comparing the period of

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the output signal of said behavior detection section with the period of the output signal of said rotation speed detection section for detecting the rotation speed of said disk,

another determination is made as to whether said magnetic ball has been attracted by said magnet or not on the basis of the output signal of said behavior detection signal, and

the operation mode is shifted to reproduction or recording after said two determinations are made.

*Sub Q5* 24. A disk drive in accordance with claim 1, 3, 4 or 17, further comprising:

a behavior detection section for detecting the behavior of said magnetic ball, and

a rotation speed detection section for detecting the rotation speed of said disk, wherein

said behavior detection section detects the timing of the separation of said magnetic ball from said magnet, and

said rotation speed detection section detects the rotation speed of said disk at the timing of said separation.

25. A disk drive in accordance with claim 17, further comprising:

a rotation speed detection section, wherein

said behavior detection section detects the timing of the attraction of said magnetic ball by said magnet, and

said rotation speed detection section detects the rotation speed of said disk at the timing of said attraction.

26. A disk drive in accordance with claim 24, wherein  
said behavior detection section detects the timing  
of the separation of said magnetic ball from said magnet,  
said rotation speed detection section detects the  
rotation speed of said disk at the timing of said separation,  
said behavior detection section detects the timing  
of the attraction of said magnetic ball by said magnet, and  
said rotation speed detection section detects the  
rotation speed of said disk at the timing of said attraction.

27. A method for controlling a disk drive comprising:  
a disk, and  
a balancer for movably accommodating one or plural  
magnetic balls in the ring-shaped hollow section thereof and  
provided with a magnet for attracting said magnetic balls inside  
said ring-shaped hollow section,

in the case when the rotation speed of said disk is  
changed from a first rotation speed including a stop state to  
a second rotation speed higher than the first rotation speed,  
said method comprising:

a step for raising the rotation speed from the first  
rotation speed to a third rotation speed higher than the second  
rotation speed, and

a step for lowering the rotation speed from the third  
rotation speed to the second rotation speed, wherein  
said magnetic ball separates from said magnet at the  
third rotation speed.

28. A method for controlling a disk drive comprising:  
a disk, and  
a balancer for movably accommodating one or plural  
magnetic balls in the ring-shaped hollow section thereof and  
provided with a magnet for attracting said magnetic balls inside  
said ring-shaped hollow section,

in the case when the rotation speed of said disk is  
changed from a first rotation speed to a second rotation speed  
lower than the first rotation speed, said method comprising:

a step for lowering the rotation speed from the first  
rotation speed to a third rotation speed lower than the second  
rotation speed, and

a step for raising the rotation speed from the third  
rotation speed to the second rotation speed, wherein

said magnetic ball is attracted by said magnet at the  
third rotation speed.

29. A disk drive in accordance with claim 8, wherein  
said impact detection section detects an impact on  
the basis of the output signal of said optical pickup.

30. A disk drive in accordance with claim 29, wherein  
said impact detection section detects an impact on  
the basis of the focus error signal or the tracking error signal  
of said optical pickup.

31. A disk drive in accordance with claim 8, wherein  
said impact detection section is a piezoelectric  
ceramic sensor.